ABSTRACT

" An Agroclimatic Study Of The Parbhani District "

Abstract Submitted for the

DOCTOR OF PHILOSOPHY

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Swami Ramanand Teerth Marathwada

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Introduction :

Agriculture in Parbhani district is linked to its agroclimatic conditions, which play a critical role in determining crop patterns, productivity, and sustainability. Parbhani spans an area of 6251 square kilometres and is characterized by a tropical climate with distinct seasons . The district receives an average rainfall of 800 -1000 mm during southwest monsoon . Black soils (Regur soils) dominate the region, offering a favorable environment for crops like cotton, soybean, and tur (Pigeon pea).

The agroclimatic study of Parbhani is essential for understanding how Climatic factors such as temperature, precipitation, and soil moisture influence the crop selection, cropping intensity, and yield.

Importance of Research :

An agroclimatic study of the Parbhani district is highly significant for understanding agroclimatic conditions, improved agricultural planning, climate change adaptation, sustainable resource management, policy formulation, enhancing farmer livelihoods and regional development as well as can serve as model for research in similar regions.

Need of Research :

Research on the agroclimatic study of parbhani district is essential for addressing agricultural challenges, enhancing sustainability, and improving farmer livelihoods.

Significance of Study :

An agroclimatic study of Parbhani district holds significant value due to its potential to address critical challenges such as climatic uncertainty and contribute to the sustainable development of agriculture in the region.The significance can be outlined as regional agricultural advancement, tackling climatic uncertainty, resource management and sustainability, policy development, agro-economic planning, contribution of academic research, development of agro-based industries and socio-economic upliftment.

Physical and Socio- Economic Characteristics of Parbhani District :

After establishment of independent Maharashtra state, Parbhani was included in Marathi speaking region. Parbhani district is situated in the central part of Maharashtra and lies between 18°45' North to 20°10' North Latitudes and 76°13' East to 77°26' East Longitudes. The study region has an area of 6250 sq.km. which is on 23rd number in Maharashtra by area. Parbhani district is situated in Deccan Plateau. It's most of the part is rocky and remaining plain is 457M high from sea level. Purna, masli, dudhana, kapra these are important rivers Parbhani district. Parbhani district's climate is hot in summer

and cold in winter. June to September rain falls here by south west monsoon winds. Average rainfall is 773 mm.

Parbhani is one of the most important district of Marathwada. It's total area is 6250 sq.km. In 2011, Parbhani's population was 1,835982 and its population growth rate is 20.18%. Density of Parbhani district is 295 people per sq.km. Literacy rate of Parbhani is 75.22%. Parbhani has 940 females for per 1000 males.

Research Methodology :

Systematic research methodology is essential to achieve the objectives of the agroclimatic study of Parbhani district. The research methodology combines field -based observations, data analysis and modern tools like GIS to provide a comprehensive understanding of the agroclimatic study of the Parbhani district.

Objective of the Study :

- Study of an agroclimatic parameters rainfall distribution, temperature variations, relative humidity, mean (wind speed, bright sunshine,evaporation rate).
- Area, production and productivity of cotton crop in Parbhani district.

Hypothesis :

Primary Hypothesis (H1): Agroclimatic factors (rainfall, temperature, soil characteristics and humidity) significantly influence the agricultural productivity and cropping patterns of Parbhani district.

Secondary Hypothesis (H2): The bright sunshine hours, evaporation, and wind speed is affected weather factor for crop production of cotton crop.

Null Hypothesis :

Null Hypothesis (H0): There is no significant relationship between agroclimatic variables and agricultural productivity in Parbhani district.

Variable :

Independent Variables: Climatic variables (rainfall, temperature,relative humidity, solar radiation), soil variables (soil type, soil fertility, soil pH, soil moisture content) are considered to influence agricultural productivity in Parbhani district.

Dependent Variables: Crop yield, crop intensity are affected by the independent agroclimatic factors.

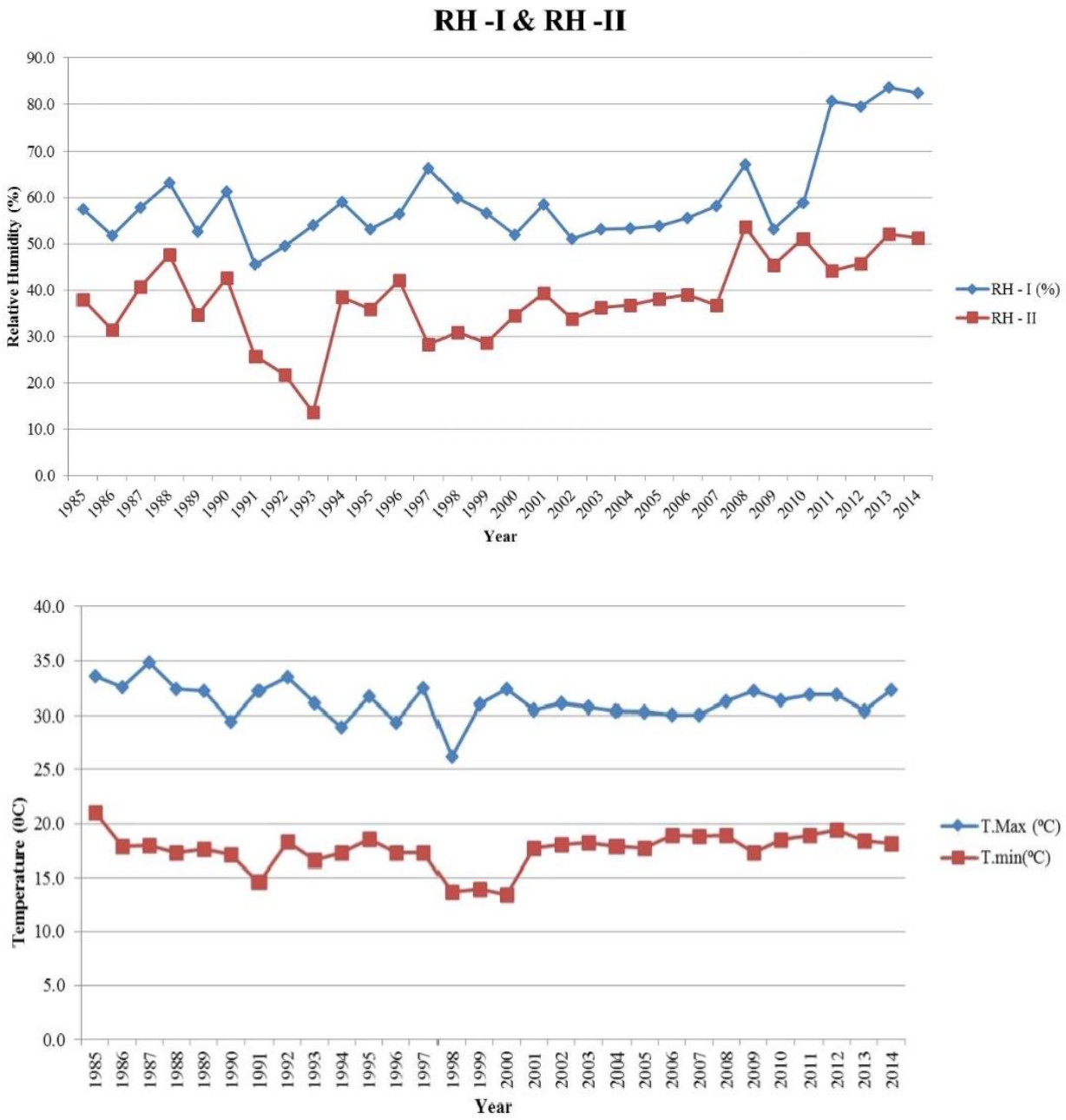

Fig.2 Yearly average RH-I and RH-II recorded in different Meteorological week at Parbhani district during 1985-2014

Fig.3 Yearly average rainfall (mm) recorded in (23 MW-5 MW) of Parbhani district during 1985-2014

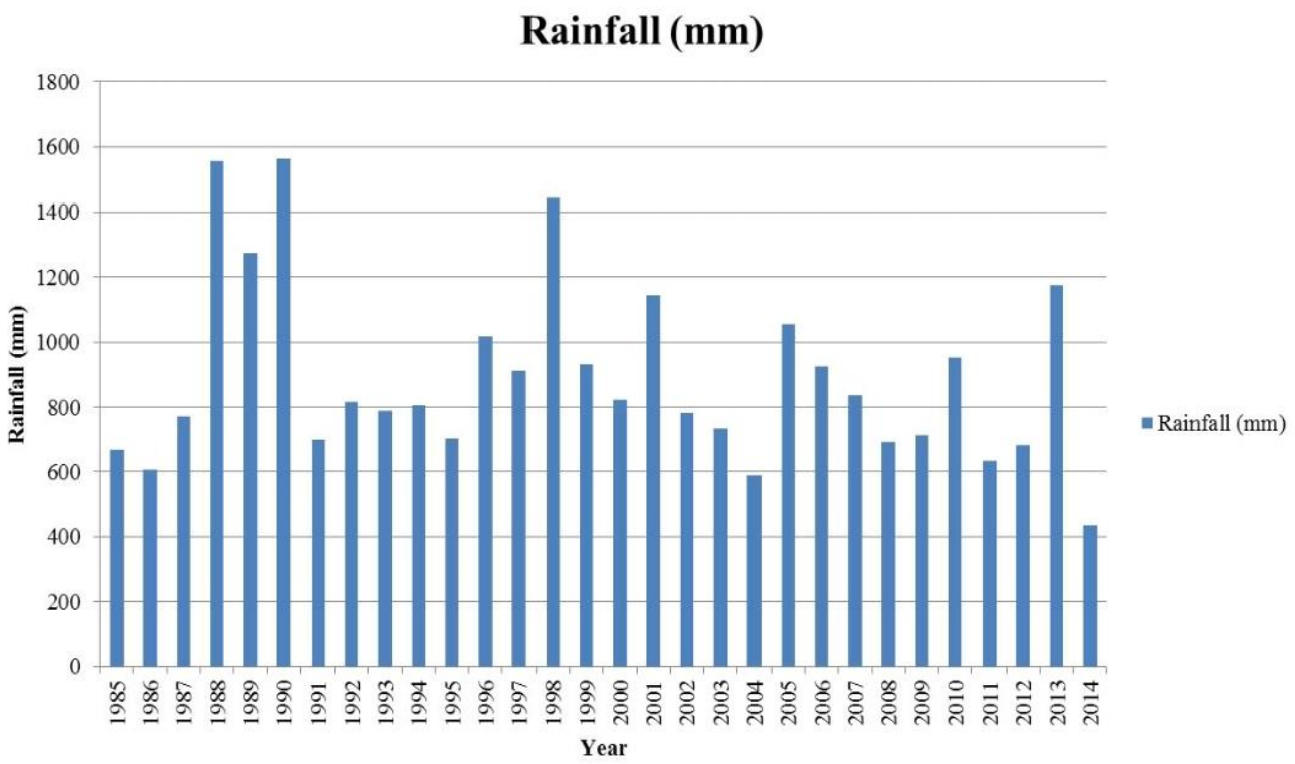

Fig.4 Yearly average bright sunshine recorded in (23 MW-5 MW) of Parbhani district 1985-2014

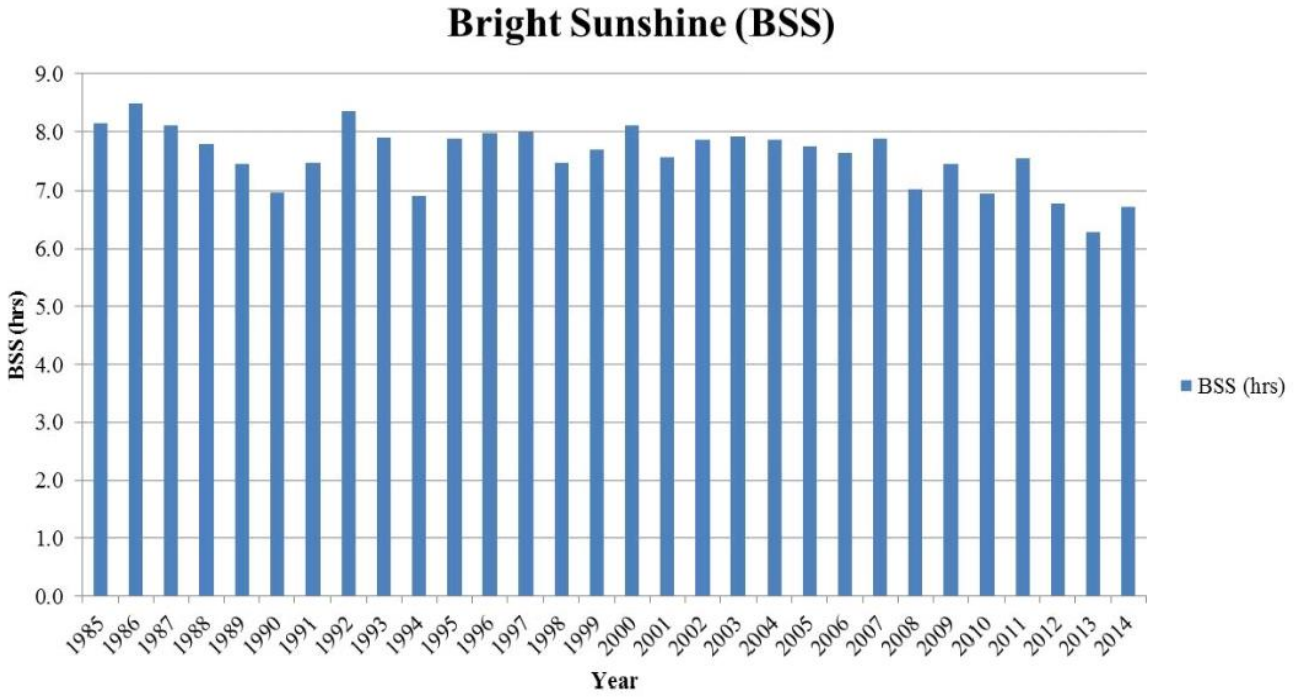

Fig.5 Yearly average evaporation recorded in different Meteorological week at Parbhani district during 1985-2014

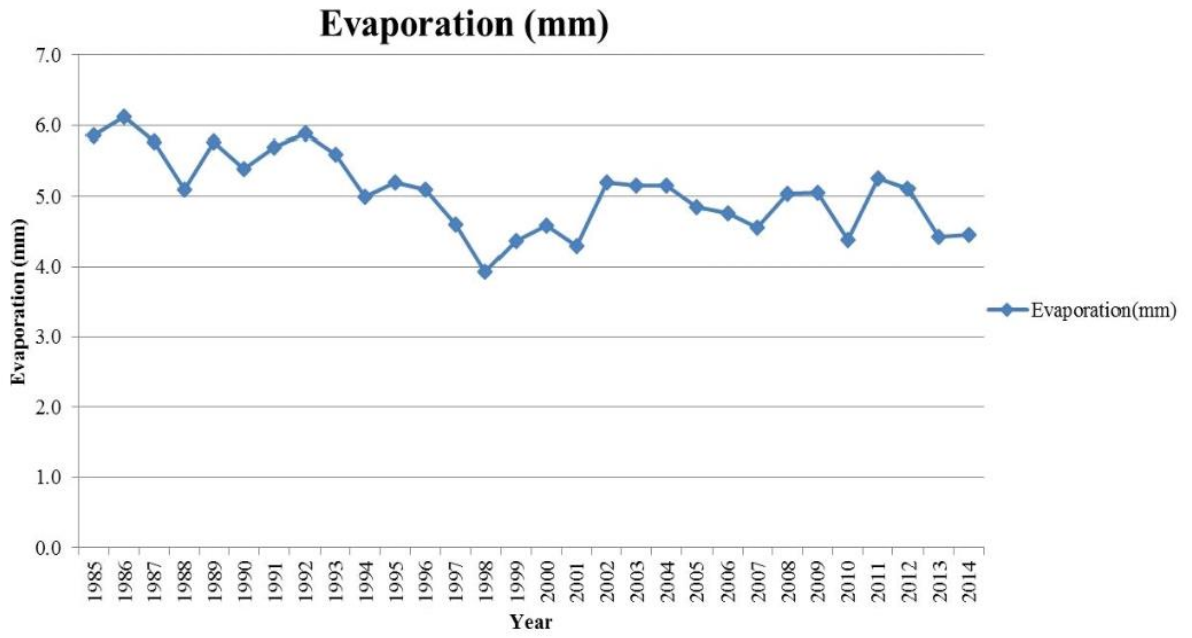

Fig.6 Yearly average wind speed recorded in different Meteorological week at Parbhani district during 1985-2014

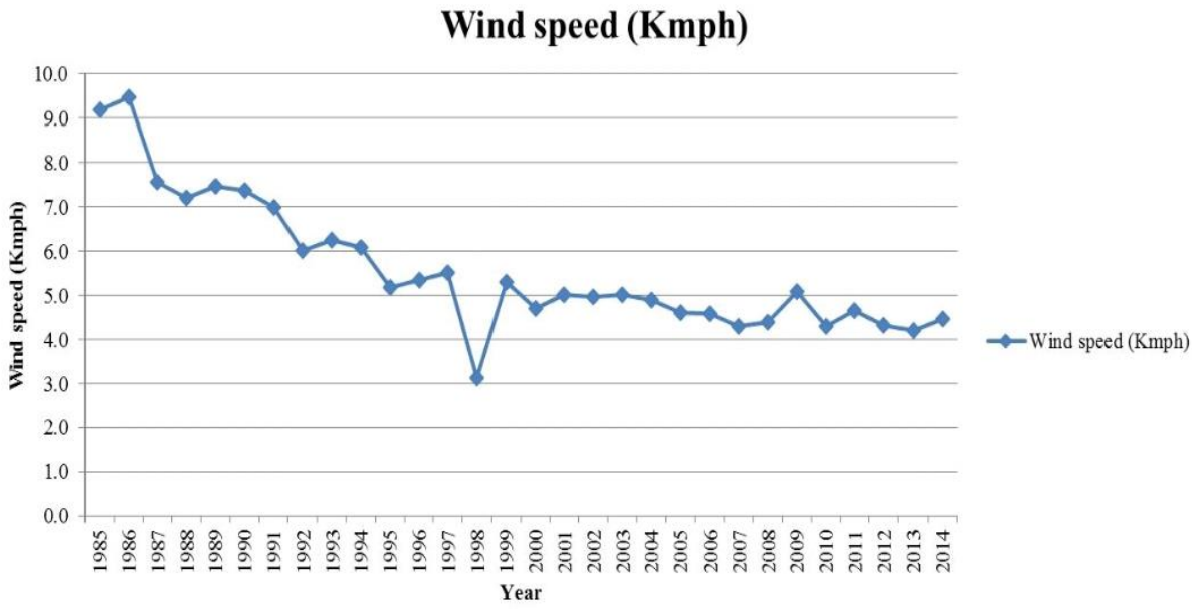

Fig.7 Trends in area, production and productivity of cotton crop in Parbhani district of Marathwada region during 1985-2014

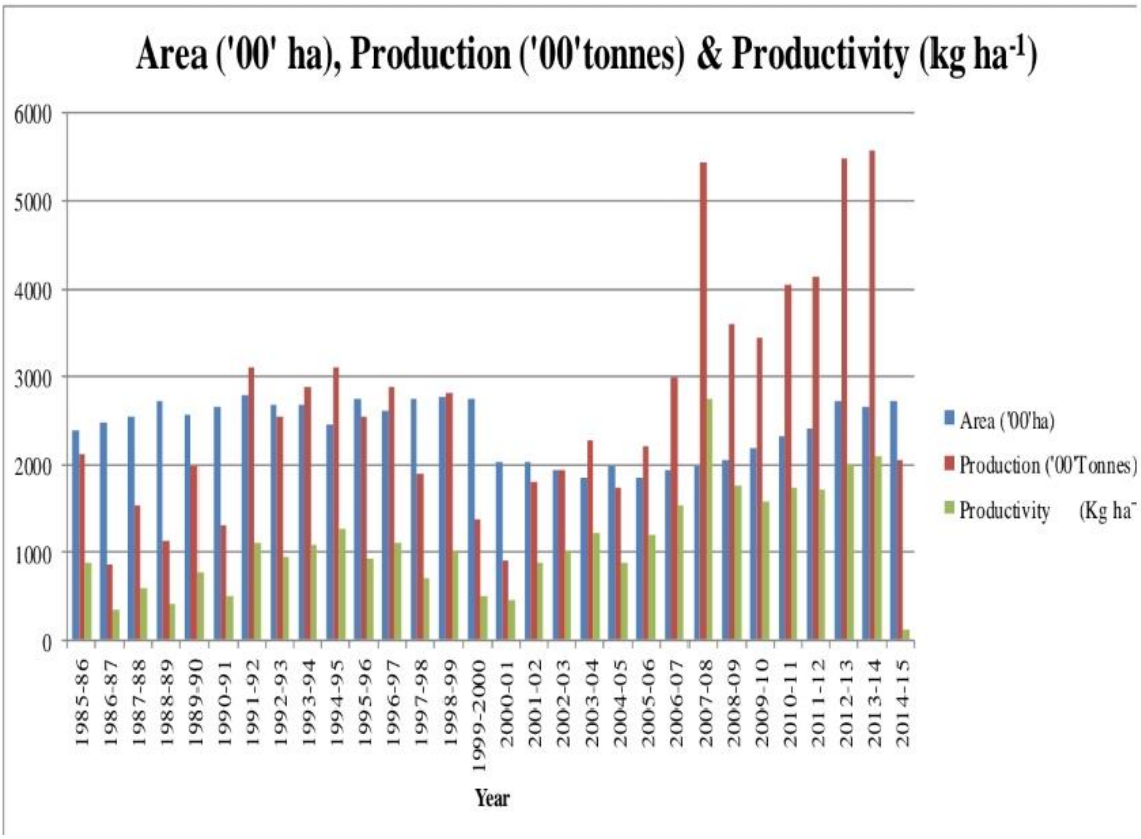

Table.1 Recorded Parbhani district weather data during 1985-2014 (23 MW-5 MW) of cotton crop

Year	T.Max (°C)	T.Min (°C)	RH-I (%)	RH-II (%)	RF (mm)	Bright Sunshine (hrs)	Evaporation (mm)	Wind Speed (Km hr^{-1})
1985-86	33.5	21.0	58	38	667.6	8.1	5.9	9.2
1986-87	32.6	17.8	52	31	607.8	8.5	6.1	9.5
1987-88	34.8	18.0	58	41	770.3	8.1	5.8	7.6
1988-89	32.4	17.3	63	48	1554.5	7.8	5.1	7.2
1989-90	32.2	17.6	53	35	1274.2	7.4	5.8	7.5
1990-91	29.5	17.1	61	43	1562.2	7.0	5.4	7.4
1991-92	32.2	14.6	46	26	700.7	7.5	5.7	7.0
1992-93	33.4	18.3	50	22	815.5	8.3	5.9	6.0
1993-94	31.1	16.6	54	14	786.9	7.9	5.6	6.2
1994-95	28.9	17.3	59	39	805	6.9	5.0	6.1
1995-96	31.7	18.6	53	36	703.8	7.9	5.2	5.2
1996-97	29.4	17.3	57	42	1018.2	8.0	5.1	5.4
1997-98	32.4	17.3	66	28	912.2	8.0	4.6	5.5
1998-99	26.2	13.7	60	31	1441.4	7.5	3.9	3.1
1999-2000	31.0	14.0	57	29	931.4	7.7	4.4	5.3
2000-01	32.4	13.4	52	35	822.5	8.1	4.6	4.7
2001-02	30.5	17.7	59	39	1143.1	7.5	4.3	5.0
2002-03	31.1	18.0	51	34	782.3	7.9	5.2	5.0
2003-04	30.8	18.2	53	36	734.8	7.9	5.2	5.0
2004-05	30.4	17.9	53	37	590.1	7.9	5.2	4.9
2005-06	30.3	17.7	54	38	1055.5	7.7	4.8	4.6
2006-07	30.0	18.9	56	39	925.4	7.6	4.8	4.6
2007-08	30.1	18.9	58	37	837.9	7.9	4.6	4.3
2008-09	31.3	18.9	67	54	692.5	7.0	5.0	4.4
2009-10	32.2	17.3	53	46	712.8	7.4	5.1	5.1
2010-11	31.4	18.5	59	51	953.7	7.0	4.4	4.3
2011-12	31.8	18.9	81	44	633	7.5	5.3	4.7
2012-13	31.9	19.4	79	46	683.2	6.8	5.1	4.3
2013-14	30.4	18.4	84	52	1175	6.3	4.4	4.2
2014-15	32.3	18.1	82	51	436.9	6.7	4.5	4.5
Mean	31.3	17.6	60	38	891.0	7.6	5.1	5.6

(Source: I.M.D., NDC, Pune and Dept. of Agril. Meteorology, VNMKV, Parbhani)

Table 2. Trends in Parbhani district area, production and productivity of cotton (lints) crop during 1985-2014

Year	Area ('00'ha)	Production ('00'tonnes)	Productivity (kg ha^{-1})
1985-86	2386	2121	888.9
1986-87	2475	858	346.7
1987-88	2536	1525	601.3
1988-89	2731	1128	413.0
1989-90	2564	1977	771.1
1990-91	2660	1307	491.4
1991-92	2801	3116	1112.5
1992-93	2687	2546	947.5
1993-94	2680	2890	1078.4
1994-95	2458	3116	1267.7
1995-96	2747	2546	926.8
1996-97	2624	2890	1101.4
1997-98	2752	1905	692.2
1998-99	2781	2818	1013.3
1999-2000	2743	1371	499.8
2000-01	2024	905	447.1
2001-02	2034	1797	883.5
2002-03	1935	1949	1007.2
2003-04	1847	2268	1227.9
2004-05	1980	1727	872.2
2005-06	1850	2216	1197.8
2006-07	1947	2988	1534.7
2007-08	1981	5445	2748.6
2008-09	2044	3610	1766.1
2009-10	2177	3437	1578.8
2010-11	2324	4048	296.0
2011-12	2405	4134	292.0
2012-13	2736	5480	341.0
2013-14	2659	705	361.0
2014-15	2736	2048	127.0
Average	2410.1	2495.7	894.4

(Divisional office (stat) Latur, Govt.of Maharashtra)

Statistical Correlation :

Statistical Correlation provides quantitive evidence for the relationships between climatic factors and agricultural outputs and practices.

Expected Outcomes :

The expected outcomes of an agroclimatic study of Parbhani district are development of agroclimatic zones, analysis of trends in rainfall, temperature, and humidity over the past decades and their spatial distribution within the district.The relationship between agroclimatic factors and crop yield of major crop like cotton. Development of region - specific agricultural strategies for sustainable farming in Parbhani district.

Limitations :

Dependency on secondary data from IMD, agricultural departments and climatic data not available at micro-level scales (e.g., village-level trends).

Summary, Conclusion and Suggestions :

An agroclimatic study of Cotton crop in Parbhani district revealed from 1985-2014 year during 23rd MW- 5th MW of each year.

Temperature: The temperature range varies between (13.7-21°C) to (26.2 - 31.3°C).

Rainfall: Rainfall is most variable during 30 years, only 8 years rainfall observed above normal rainfall.

Relative Humidity: Continuous fluctuations found between morning and afternoon relative humidity.

Mean bright sunshine, mean evaporation rate and mean wind speed are 7.6hrs, 5.1mm, and 5.6kmph respectively.

Area, production and productivity of Cotton crop:

Increase continuous in area and production but last five years productivity of Cotton crop decreasing trend is noticed in Parbhani district.

Chapter Scheme :

The research study is divided into seven chapters as follows :

1) Introduction.

2) Physical and Socio -economic characteristics of Parbhani district.

3) Influence of an agroclimatic factors on crop production of Cotton crop in Parbhani district.

4) Significant relationship between an agroclimatic variables and an agricultural productivity in Parbhani district.

5) Annual an agroclimatic parameters recorded in different Meteorological week at Parbhani district during 1985-2014.

6) Case Study : Cotton crop in area, production and productivity in Parbhani district of Marathwada region during 1985-2014.

7) Summary, Conclusion and Suggestions.

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